(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 091 474 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
23.11.2022 Bulletin 2022/47

(21) Application number: **21740830.1**

(22) Date of filing: **15.01.2021**

(51) International Patent Classification (IPC):
A24F 40/46 *(2020.01)* ***A24F 40/40*** *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24F 40/40; A24F 40/46

(86) International application number:
PCT/CN2021/072137

(87) International publication number:
WO 2021/143838 (22.07.2021 Gazette 2021/29)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **16.01.2020 CN 202010061563**

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(54) **SMOKING SET**

(57) The present application relates to the field of smoking sets and provides a smoking set which comprises: a heating cavity and a heater; a first detection module, being configured to detect whether an object exists at a first position in the heating cavity to output a first detection signal; a second detection module, being configured to detect whether an object exists at a second position in the heating cavity to output a second detection signal; a microcontroller, being configured to: acquire the first detection signal and the second detection signal; identify object situation in the heating cavity according to different combinations of the first detection signal and the second detection signal. According to the present application, object situation in the heating cavity is identified according to different combinations of the first detection signal and the second detection signal; and the heater may be controlled to start heating or be turned off according to the identification result, thereby preventing foreign bodies falling into the heating cavity from wrongly triggering the heater to start heating, and improving user experience.

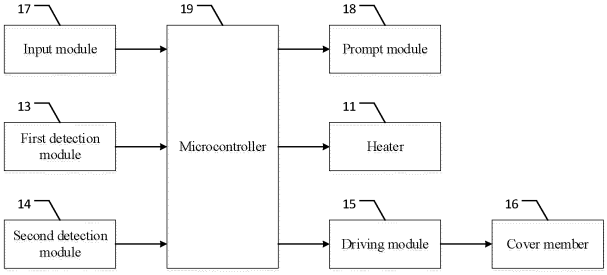

FIG. 1

EP 4 091 474 A1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to Chinese Patent Application No. 2020100615637, filed with the Chinese Patent Office on January 16, 2020, titled "SMOKING SET", the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present application relates to the field of smoking sets, and in particular, relates to a smoking set.

BACKGROUND

[0003] Smoking articles such as cigarettes and cigars burn tobacco to produce smoke during use. Attempts have been made to provide substitutes for these tobacco-burning articles by producing products that release compounds without burning. Examples of such products are so-called incombustible products which are incombustible when heated and release compounds by heating instead of burning tobacco.

[0004] Patent Publication No. CN209202153U discloses a control method for an electronic cigarette and an electronic cigarette. When tobacco is inserted into the electronic cigarette, it will trigger a tobacco heating signal, and the tobacco heating signal will control a tobacco heating element to operate so as to bake the tobacco. Triggering modes of the tobacco heating signal include the following cases: after the tobacco is inserted into the cavity of the electronic cigarette, the tobacco presses a pressure sensor in the cavity of the electronic cigarette, and the pressure sensor detects the change in pressure to generate the tobacco heating signal; or after the tobacco is inserted into the cavity of the electronic cigarette, a capacitance sensor in the cavity of the electronic cigarette detects the change in capacitance to generate the tobacco heating signal; alternatively, after the tobacco is inserted into the cavity of the electronic cigarette, the tobacco presses a touch switch in the cavity of the electronic cigarette, and then the touch switch is triggered to send the tobacco heating signal.

[0005] Problems of this scheme lie in that: when a foreign body falls into the cavity of the electronic cigarette, the tobacco heating signal will also be triggered to make the heating element start heating; and the electronic cigarette cannot identify the presence of foreign bodies in the cavity of the electronic cigarette.

SUMMARY

[0006] The present application provides a smoking set, which is intended to solve the problem that the existing smoking sets cannot identify the presence of foreign bodies in a heating cavity.

[0007] A first aspect of the present application provides a smoking set which comprises a heating cavity and a heater, the heater is configured to heat a smoking article removably placed in the heating cavity to generate aerosol for inhalation; and the smoking set further comprises: a first detection module, being configured to detect whether an object exists at a first position in the heating cavity to output a first detection signal; a second detection module, being configured to detect whether an object exists at a second position in the heating cavity to output a second detection signal; a microcontroller, being configured to: acquire the first detection signal and the second detection signal; identify object situation in the heating cavity according to different combinations of the first detection signal and the second detection signal.

[0008] For the smoking set provided according to the present application, object situation in the heating cavity is identified according to different combinations of the first detection signal and the second detection signal; and the heater may be controlled to start heating or be turned off according to the identification result, thereby preventing foreign bodies falling into the heating cavity from wrongly triggering the heater to start heating, and improving user experience.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] One or more embodiments are illustrated by pictures in corresponding attached drawings, and this does not constitute limitation on the embodiments. Elements with the same reference numerals in the attached drawings are shown as similar elements, and the pictures in the attached drawings do not constitute scale limitation unless otherwise stated particularly.

FIG 1 is a control block diagram of a smoking set provided according to an embodiment of the present application.

FIG. 2 is a schematic view of a smoking set provided according to an embodiment of the present application.

FIG. 3 is a schematic cross-sectional view of a smoking set provided according to an embodiment of the present application.

FIG. 4 is a schematic view of a heater with a metal elastic sheet provided according to an embodiment of the present application.

DETAILED DESCRIPTION

[0010] In order to facilitate the understanding of the present application, the present application will be explained in more detail below with reference to the attached drawings and the detailed description. It shall be noted that, when an element is expressed as "fixed to" another element, it may be directly on another element, or there may be one or more intervening elements therebetween. When an element is expressed as "connect-

ed" to another element, it may be directly connected to another element, or there may be one or more intervening elements therebetween. Terms such as "up", "down", "left", "right", "inside", "outside" and other similar expressions used in this specification are for illustrative purposes only.

[0011] Unless otherwise defined, all technical and scientific terms used in this specification have the same meanings as commonly understood by those skilled in the art of the present application. In this specification, the terms used in the specification of the present application are only for the purpose of describing specific embodiments, and are not intended to limit the present application. The term "and/or" used in this specification comprises any and all combinations of one or more related items listed.

[0012] As shown in FIG. 1 to FIG. 3, an embodiment of the present application provides a smoking set 10, which at least comprises a heater 11, a heating cavity 12, a first detection module 13, a second detection module 14, a driving module 15, a cover member 16, an input module 17, a prompt module 18 and a microcontroller 19 which are arranged in the housing.

[0013] The heater 11 is configured to heat the smoking article removably placed in the heating cavity 12 to generate aerosol for inhalation. The smoking article comprises an aerosol-forming matrix, which is used with the smoking set 10 to volatilize at least one component of the aerosol-forming matrix.

[0014] The aerosol-forming matrix is a matrix which can release volatile compounds capable of forming the aerosol. This kind of volatile compounds can be released by heating the aerosol-forming matrix. The aerosol-forming matrix may be a solid or a liquid or comprise solid and liquid components. The aerosol-forming matrix may be adsorbed, coated, impregnated or otherwise loaded on a carrier or support. The aerosol-forming matrix may conveniently be a part of an aerosol-generating article or a smoking article.

[0015] The aerosol-forming matrix may comprise nicotine. The aerosol-forming matrix may comprise tobacco, for example, a tobacco-containing material containing a volatile compound with a tobacco flavor, and the volatile compound with the tobacco flavor is released from the aerosol-forming matrix when it is heated. A preferred aerosol-forming matrix may comprise a homogeneous tobacco material, such as deciduous tobacco. The aerosol-forming matrix may comprise at least one aerosol-forming agent, which may be any suitable and known compound or a mixture of compounds. During use, the compound or the mixture of compounds is conducive to the formation of stable aerosol, and is basically resistant to thermal degradation at the operating temperature of the aerosol-generating system. Suitable aerosol-forming agents are well known in the art and include but are not limited to: polyols such as triethylene glycol, 1,3-butanediol and glycerol; esters of polyols, such as glyceryl mono-, di- or tri-acetate; and fatty acid esters of mono-, di- or poly-carboxylic acids, such as dimethyl dodecanedioate and dimethyl tetradecanedioate. The preferred aerosol-forming agent is polyhydric alcohols or a mixture thereof, such as triethylene glycol, 1,3-butanediol and the most preferred glycerine.

[0016] The heater 11 may operate at a central heating mode (in which the periphery of the heating body is in direct contact with the aerosol-forming matrix) and a peripheral heating mode (in which the cylindrical heating body wraps the aerosol-forming matrix), and the heater may also heat the aerosol-forming matrix by one or more of heat conduction, electromagnetic induction, chemical reaction, infrared action, resonance, photoelectric conversion and photothermal conversion to generate inhalable aerosol.

[0017] The following description takes the case where the heater 11 is an infrared heater as an example for illustration.

[0018] The infrared heater 11 comprises a base and an infrared electrothermal layer (not shown in the figure).

[0019] The base may be in cylindrical, prismatic or other column shapes, and preferably, in a cylindrical shape. A heating cavity 12 is formed inside the base, and the housing of the smoking set 10 has a via corresponding to the heating cavity 12, through which the smoking article may be removed from or inserted into the heating cavity 12.

[0020] The infrared electrothermal layer is formed on the outer surface of the base, the infrared electrothermal layer receives the electric power of the power supply through the electrode to generate heat, and at least transmits the generated heat to the smoking article inserted into the heating cavity 12 by infrared radiation.

[0021] Still referring to FIG. 3, the first detection module 13 is arranged downstream (at the first position) of the aerosol flow direction (indicated by the dotted arrow in the figure) in the heating cavity 12, and the second detection module 14 is arranged upstream (at the second position) of the aerosol flow direction in the heating cavity 12. That is, the first position and the second position are spaced apart along the aerosol flow direction in the heating cavity 12, and the first position is located downstream of the aerosol flow direction and the second position is located upstream of the aerosol flow direction.

[0022] In this example, the first detection module 13 comprises a light emitting diode 131 and a photosensor 132, which are arranged face to face along the transverse direction of the heating cavity 12. The second detection module 14 adopts an ultrasonic sensor. Reference may be made to the prior art for the principle or working mode of the sensor, and this will not be further described herein.

[0023] The first detection module 13 is configured to detect whether an object exists at the first position in the heating cavity 12 to output a first detection signal.

[0024] The second detection module 14 is configured to detect whether an object exists at the second position in the heating cavity 12 to output a second detection signal.

[0025] The microcontroller 19 is configured to: acquire the first detection signal and the second detection signal; identify object situation in the heating cavity 12 according to different combinations of the first detection signal and the second detection signal.

[0026] The identification results may include the following four situations: the object in the heating cavity 12 is a foreign body; the object in the heating cavity 12 is a smoking article but the smoking article is not inserted in place in the heating cavity 12; the object in the heating cavity 12 is a smoking article and the smoking article has been inserted in place in the heating cavity 12; and there is no object in the heating cavity 12.

[0027] As an example, it is assumed that: when the first detection signal is at a high level, then it means that there is an object at the first position in the heating cavity 12; and when the first detection signal is at a low level, then it means that there is no object at the first position in the heating cavity 12. This equally applies to the second detection signal.

[0028] When the first detection signal and the second detection signal acquired by the microcontroller 19 are (1, 1), it may be determined that the object in the heating cavity 12 is a smoking article and the smoking article has been inserted in place in the heating cavity 12. The first "1" in the brackets indicates that the first detection signal is at a high level (if it is "0", then it indicates a low level), and the second "1" in the brackets indicates that the second detection signal is at a high level (if it is "0", then it indicates a low level). This equally applies to the following description, and thus will not be further described herein.

[0029] When the first detection signal and the second detection signal acquired by the microcontroller 19 are (1, 0), it may be determined that the object in the heating cavity 12 is a smoking article, but the smoking article is not inserted in place in the heating cavity 12.

[0030] When the first detection signal and the second detection signal acquired by the microcontroller 19 are (0, 1), it may be determined that the object in the heating cavity 12 is a foreign body.

[0031] When the first detection signal and the second detection signal acquired by the microcontroller 19 are (0, 0), it may be determined that there is no object in the heating cavity 12.

[0032] Therefore, object situation in the heating cavity 12 is identified according to different combinations of the first detection signal and the second detection signal; and the heater 11 may be controlled to start heating or be turned off according to the identification result, thereby preventing foreign bodies falling into the heating cavity 12 from wrongly triggering the heater 11 to start heating, and improving user experience.

[0033] It shall be noted that, it is also feasible if the identification result is one, two or three of the above four situations.

[0034] It shall be additionally noted that, in order to avoid the abnormal fluctuation of the first detection signal or the second detection signal acquired, multiple times of acquisition may be performed for processing. For example, if the first detection signal output by the first detection module 13 fluctuates between "1" and "0" when a foreign body falls into the heating cavity 12 (when the foreign body passes through the first detection module 13, "1" is output; and after the foreign body passes through the first detection module 13, "0" is output), then the microcontroller 19 may perform acquisition and determination again after a preset time to avoid the fluctuation.

[0035] Specifically, in an example, the microcontroller 19 is further configured to: control the heater 11 to be turned off when the object in the heating cavity 12 is a foreign body, or when the object in the heating cavity 12 is a smoking article but the smoking article is not inserted in place in the heating cavity 12, or when there is no object in the heating cavity 12.

[0036] In an example, the microcontroller 19 is further configured to: generate prompt information when the object in the heating cavity 12 is a foreign body, or when the object in the heating cavity 12 is a smoking article but the smoking article is not inserted in place in the heating cavity 12, or when there is no object in the heating cavity 12.

[0037] The smoking set 10 further comprises: a prompt module 18, being configured to receive the prompt information and prompt the user that there is an abnormality.

[0038] In this example, the user may be prompted by means of vibration, sound, light or other means that the user can perceive, and this is not particularly limited herein.

[0039] In an example, the microcontroller 19 is further configured to: control the heater 11 to start heating when the object in the heating cavity 12 is a smoking article and the smoking article has been inserted in place in the heating cavity 12.

[0040] In this example, when the identification result of the microcontroller 19 for the object situation in the heating cavity 12 is that the object in the heating cavity 12 is a smoking article, it means that the smoking article has been inserted into the heating cavity 12 and inserted at the second position in the heating cavity 12, and at this time, the heater 11 may be controlled to start heating, and it is unnecessary for the user to manually control the heater 11 to start heating.

[0041] Further speaking, in this example, the microcontroller 19 is further configured to: acquire the first detection signal and the second detection signal again; determine whether the smoking article still exists in the heating cavity 12 according to the first detection signal and the second detection signal acquired again; control the heater 11 to stop heating if the smoking article does not exist in the heating cavity 12.

[0042] In this case, it may be determined that the smoking article has been removed from the heating cavity 12, so the heater 11 is controlled to stop heating.

[0043] Still referring to FIG. 1 to FIG. 3, in an example, the smoking set 10 further comprises: a cover member

16, being configured to cover or open the heating cavity 12; a driving module 15, being configured to receive the control of the microcontroller 19 and drive the cover member 16 to move to cover or open the heating cavity 12.

[0044] In this example, the driving module 15 comprises a motor and a gear, the cover member 16 is a sliding cover, and the sliding cover is provided thereon with a rack matched with the gear. Under the control of the microcontroller 19, the motor drives the gear to rotate, and the rotation of the gear drives the rack to move so that the sliding cover moves left and right to cover or open the heating cavity 12. FIG. 2 shows the case where the cover member 16 covers the heating cavity 12; and FIG. 3 shows the case where the cover member 16 opens the heating cavity 12. It shall be noted that, the driving module 15 and the cover member 16 are not limited to the above situations.

[0045] In an example, the smoking set 10 further comprises: an input module 17, being configured to receive an opening instruction input by a user to generate an opening signal, or receive a closing instruction input by a user to generate a closing signal.

[0046] The microcontroller 19 is further configured to: receive the opening signal, and control the driving module 15 to drive the cover member 16 to move according to the opening signal so that the cover member 16 opens the heating cavity 12; or receive the closing signal, and control the driving module 15 to drive the cover member 16 to move according to the closing signal so that the cover member 16 covers the heating cavity 12.

[0047] In this example, the input module 17 is a key. In other examples, the input module 17 is not limited to a key, and for example, it may be a touch screen, a voice-controlled input device, or the like.

[0048] In an example, the microcontroller 19 is further configured to: control the driving module 15 to drive the cover member 16 to move so that the cover member 16 covers the heating cavity 12 when there is no object in the heating cavity 12.

[0049] In this example, when there is no object in the heating cavity 12, the driving module 15 is automatically controlled to drive the cover member 16 to move, so that the cover member 16 covers the heating cavity 12 to prevent foreign bodies from falling into the heating cavity 12.

[0050] Still referring to FIG. 4, in an example, the second detection module 14 is implemented by a metal elastic sheet. When the smoking article is inserted at the second position in the heating cavity 12, the smoking article will exert a stress on the metal elastic sheet, which results in deformation of the metal elastic sheet. The deformation may be converted into an electrical signal by a conversion circuit, and then the electrical signal is acquired by the microcontroller 19.

[0051] It shall be noted that, the first detection module 13 and the second detection module 14 are not limited to the situations described above.

[0052] In an example, the first detection module 13 and the second detection module 14 may be sensor devices with varying resistance values which sense the position of the smoking article through the change of resistance values. The sensor devices with varying resistance values include but not limited to pressure resistors, inductive resistors, resistive film matrix, thermistors, photoresistors, airflow switches, and coil windings.

[0053] In an example, the first detection module 13 and the second detection module 14 may be signal transmitting and receiving devices, which send out signals to detect the position information of the smoking article and feed the position information of the smoking article back to the signal transmitting and receiving devices. The signals sent by the signal transmitting and receiving devices include but not limited to infrared rays, radar waves, microwaves, ultrasonic waves and communication waves (radio waves, optical fibers, WIFI and quantum waves).

[0054] In an example, the first detection module 13 and the second detection module 14 may be mechanical switch devices which are electrically connected with a detection circuit. When the smoking article touches the mechanical switch device, the detection circuit is turned on/off. The mechanical switch devices include but not limited to micro-switches, key switches, elastic sheet switches, spring switches, membrane switches, toggle switches, pull switches, rotary switches and magnet switches.

[0055] In an example, the first detection module 13 and the second detection module 14 may be strain sensors or pressure sensors.

[0056] It shall be noted that, the specification and attached drawings of the present application show preferred embodiments of the present application. However, the present application can be implemented in many different forms, and it is not limited to the embodiments described in this specification. These embodiments are not construed as additional restrictions on the content of the present application, but are provided for a more thorough and comprehensive understanding of the disclosure of the present application. In addition, the above technical features continue to be combined with each other to form various embodiments not listed above, all of which are regarded as within the scope described in the specification of the present application. Further speaking, those of ordinary skill in the art can make improvements or variations according to the above description, and all these improvements and variations shall fall within the scope claimed in the appended claims of the present application.

Claims

1. A smoking set, comprising a heating cavity and a heater, the heater being configured to heat a smoking article removably placed in the heating cavity to generate aerosol for inhalation; **characterized in that**, the smoking set further comprising:

a first detection module, being configured to detect whether an object exists at a first position in the heating cavity to output a first detection signal;
a second detection module, being configured to detect whether an object exists at a second position in the heating cavity to output a second detection signal;
a microcontroller, being configured to:

acquire the first detection signal and the second detection signal;
identify object situation in the heating cavity according to different combinations of the first detection signal and the second detection signal.

2. The smoking set according to Claim 1, **characterized in that**, the microcontroller is further configured to:
control the heater to be turned off when the object in the heating cavity is a foreign body, or when the object in the heating cavity is a smoking article but the smoking article is not inserted in place in the heating cavity, or when there is no object in the heating cavity.

3. The smoking set according to Claim 2, **characterized in that**, the microcontroller is further configured to:

generate prompt information when the object in the heating cavity is a foreign body, or when the object in the heating cavity is a smoking article but the smoking article is not inserted in place in the heating cavity, or when there is no object in the heating cavity;
the smoking set further comprises:
a prompt module, being configured to receive the prompt information and prompt the user that there is an abnormality.

4. The smoking set according to Claim 1, **characterized in that**, the microcontroller is further configured to:
control the heater to start heating when the object in the heating cavity is a smoking article and the smoking article has been inserted in place in the heating cavity.

5. The smoking set according to Claim 4, **characterized in that**, the microcontroller is further configured to:

acquire the first detection signal and the second detection signal again; determine whether the smoking article still exists in the heating cavity according to the first detection signal and the second detection signal acquired again;
control the heater to stop heating if the smoking article does not exist in the heating cavity.

6. The smoking set according to any of Claims 1 to 5, **characterized in that**, the smoking set further comprises:

a cover member, being configured to cover or open the heating cavity;
a driving module, being configured to receive the control of the microcontroller and drive the cover member to move to cover or open the heating cavity.

7. The smoking set according to Claim 6, **characterized in that**, the smoking set further comprises:

an input module, being configured to receive an opening instruction input by a user to generate an opening signal, or receive a closing instruction input by a user to generate a closing signal;
the microcontroller is further configured to:

receive the opening signal, and control the driving module to drive the cover member to move according to the opening signal so that the cover member opens the heating cavity; or
receive the closing signal, and control the driving module to drive the cover member to move according to the closing signal so that the cover member covers the heating cavity.

8. The smoking set according to Claim 6, **characterized in that**, the microcontroller is further configured to:
control the driving module to drive the cover member to move so that the cover member covers the heating cavity when there is no object in the heating cavity.

9. The smoking set according to any of Claims 1 to 8, **characterized in that**, the first position and the second position are spaced apart along the aerosol flow direction in the heating cavity, and the first position is located downstream of the aerosol flow direction and the second position is located upstream of the aerosol flow direction.

10. The smoking set according to Claim 9, **characterized in that**, both the first detection module and the second detection module are selected from the group consisting of sensor devices with varying resistance values, signal transmitting and receiving devices, mechanical switch devices, metal elastic sheets, strain sensors, pressure sensors and ultrasonic sensors.

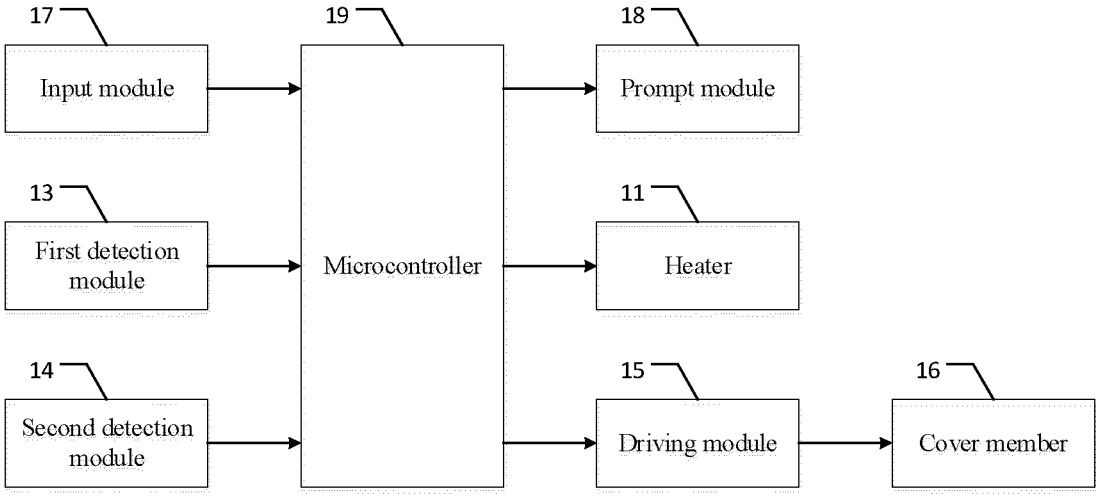
17
Input module
19
Microcontroller
18
Prompt module
13
First detection module
11
Heater
14
Second detection module
15
Driving module
16
Cover member

FIG. 1

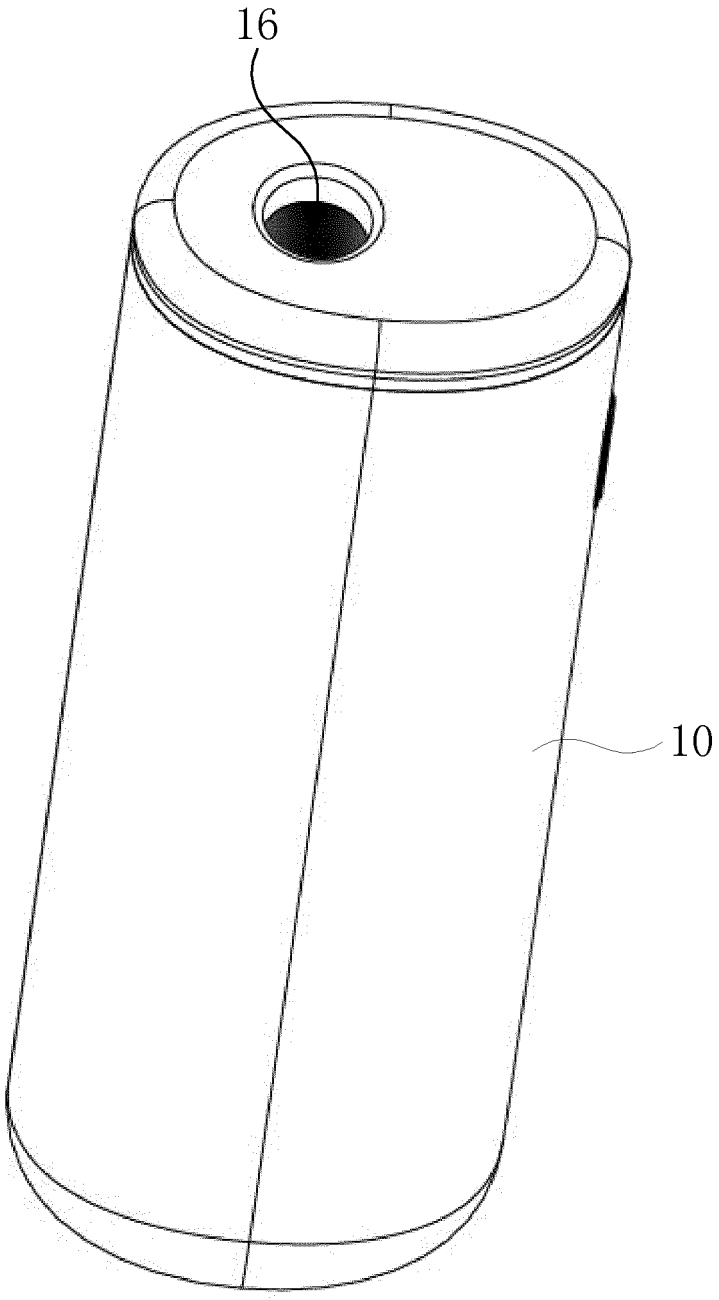

FIG. 2

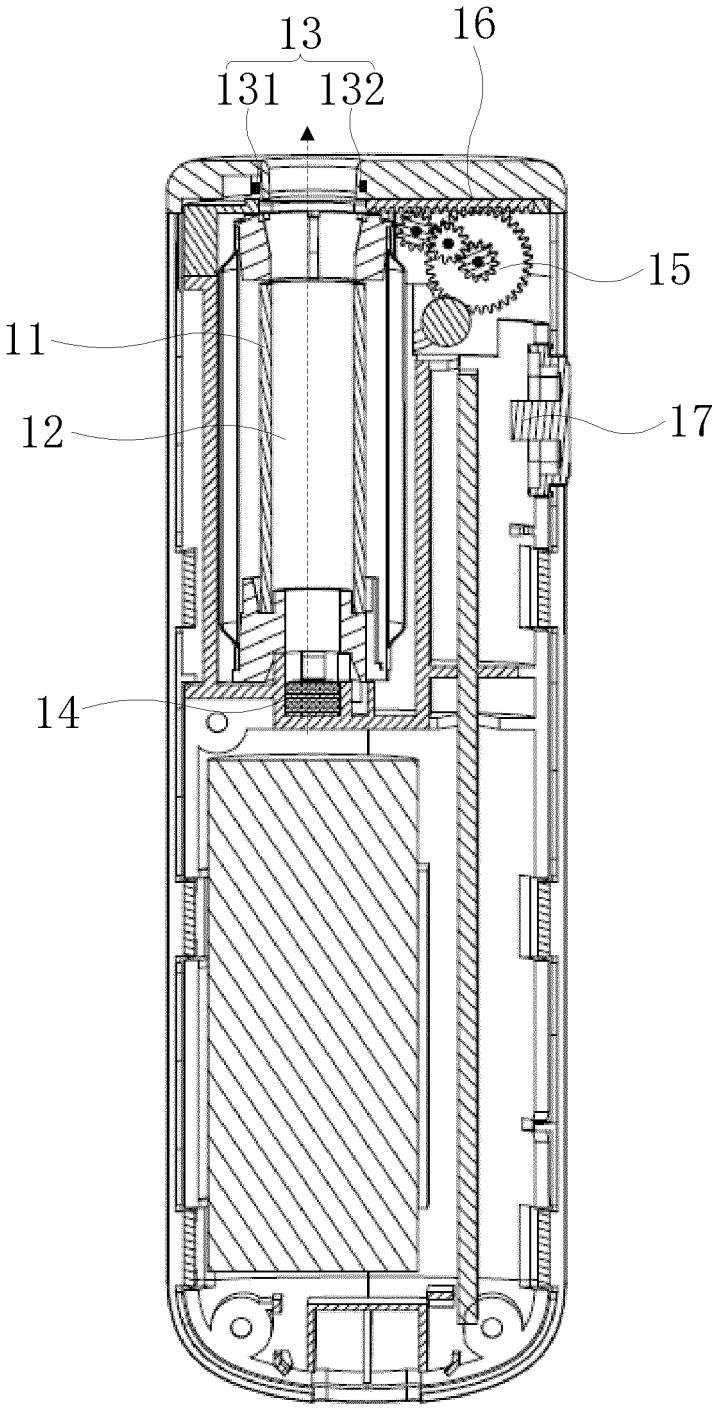

FIG. 3

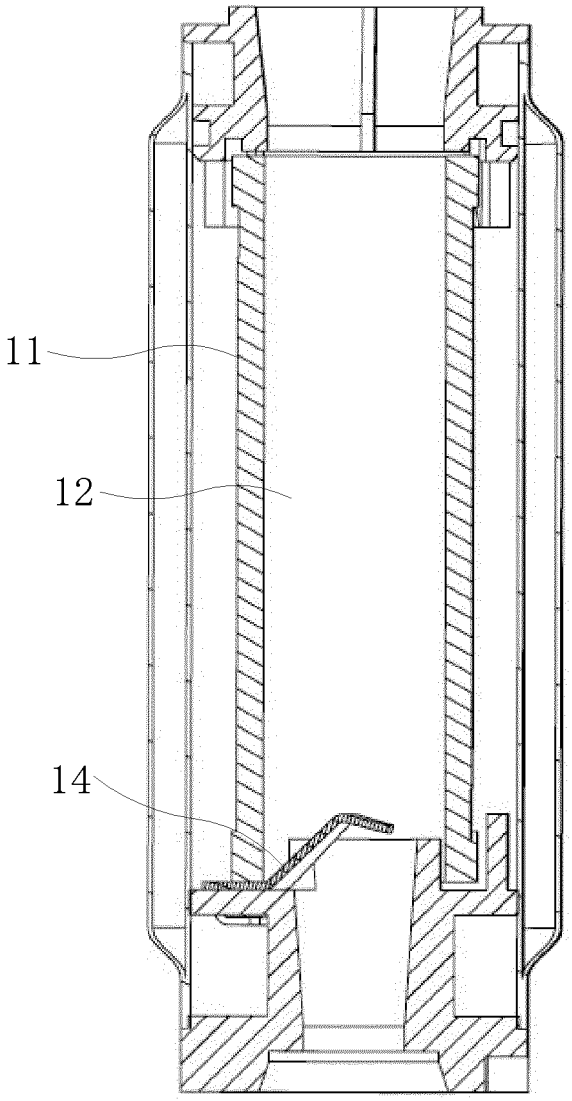

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/072137

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/46(2020.01)i; A24F 40/40(2020.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24F; A24B; A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI; EPODOC; CNPAT; CNKI; 深圳市合元科技有限公司, 电子烟, 气溶胶, 烟具, 吸烟, 电, 加热, 检测, 控制器, 传感器, 开关, 弹片, 距离, 位置, 插入, 提醒, 提示, 盖, 门, 异物, 驱动, vaporiz+, evaporator, heat+, gasoloid, sensor?, position?, electronic, cigarette, tabacco, controller, distance, detect+, measure+, insert+, foreign, first, second

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 110612034 A (KTANDG CORPORATION) 24 December 2019 (2019-12-24) description, paragraphs 0034-172, and figures 1-11	1-3, 5-10
Y	CN 110612034 A (KTANDG CORPORATION) 24 December 2019 (2019-12-24) description, paragraphs 0034-172, and figures 1-11	4
Y	CN 107898008 A (CHANGZHOU PAITENG ELECTRONIC TECHNOLOGY SERVICE CO., LTD.) 13 April 2018 (2018-04-13) description, paragraphs 0066-0075, and figures 1-6	4
A	CN 109393565 A (CHANGZHOU PAITENG ELECTRONIC TECHNOLOGY SERVICE CO., LTD.) 01 March 2019 (2019-03-01) entire document	1-10
A	CN 209202153 U (CHINA TOBACCO HUNAN INDUSTRIAL CO., LTD.) 06 August 2019 (2019-08-06) entire document	1-10
A	WO 2016101150 A1 (HUIZHOU KIMREE TECHNOLOGY CO., LTD.) 30 June 2016 (2016-06-30) entire document	1-10

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 April 2021	**16 April 2021**

Name and mailing address of the ISA/CN	Authorized officer
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Facsimile No. **(86-10)62019451**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/072137

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 2017027223 A1 (CLOUD V ENTERPRISES et al.) 02 February 2017 (2017-02-02) entire document	1-10

Form PCT/ISA/210 (second sheet) (January 2015)

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